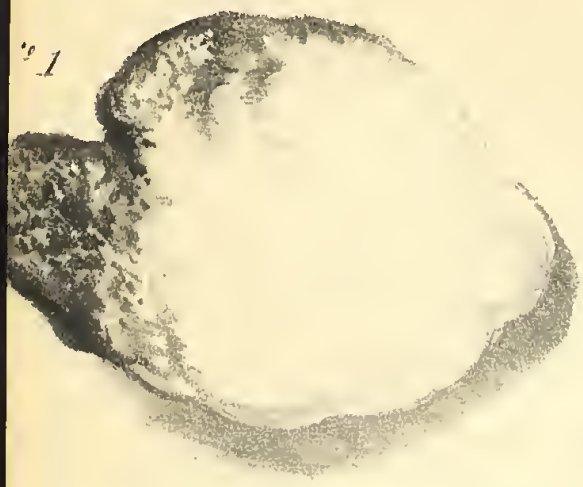
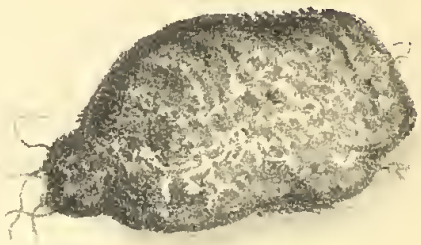
Specimen of the Diseased Potatoe 12000 times Magnified.

°1

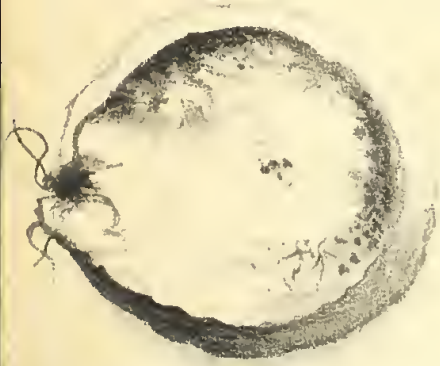


side Slice of Potatoe affected entirely on one side

N.° 2



Slice cut from the middle wholly and entirely diseased.



N.° 3

ecimen of Potatoe known by the name of adical partly affected.

N.° 4

Slice of the entire Potatoe cut through the middle; the Top edge of the Cuts being scraped, shewing the disease in a slight form

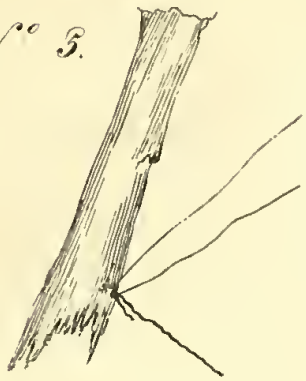
hite parts of the Specimens illustrate the Crystallised salts, Gluten, and Farina contained Potatoe.

Microscopic View of

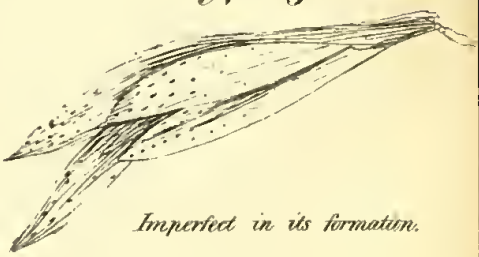
GERMS OF WHEAT

in their several Stages of Formation.

N°. 5.



N°. 6



Imperfect in its formation.

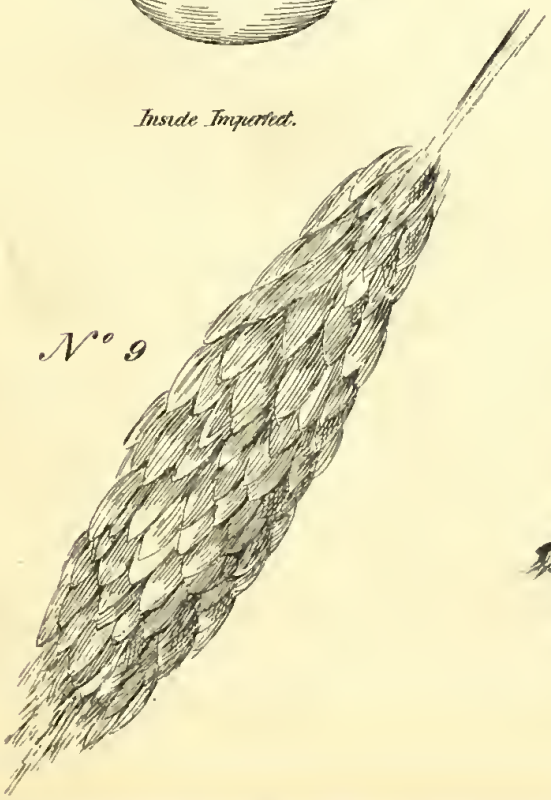
N°. 7

Inside Imperfect.

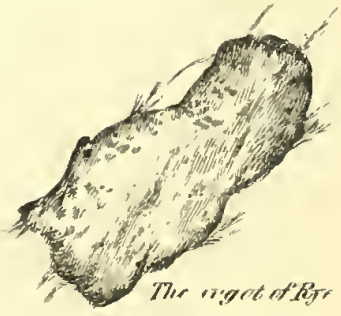
N°. 8

Inside Perfect.

N°. 9



N°. 10



The ergot of Rye

AN ESSAY

ON

THE POTATOE.

BY J. C. ABRAHAM,

Chemist and Botanist,

WITH DRAWINGS, TAKEN UNDER THE MICROSCOPE EXPRESSLY FOR THIS ESSAY,

OF THE

MURRAIN OR DISEASED POTATOES.

ALSO, SEVERAL

DRAWINGS OF GERMS OF DISEASED WHEAT & RYE,

SHOWING THE SIMILARITY OF THE DISEASE OF THIS ROOT TO CERTAIN DISEASES IN THOSE PLANTS.

IN THIS ESSAY IS GIVEN THE MOST

SCIENTIFIC METHOD OF CULTIVATING THE ROOT,

OF PRESERVING IT FOR SEED, AND FROM FURTHER DECAY.

ALSO, A SIMPLE METHOD OF

DETECTING THE PRESENCE OF PUTRESCENCE.

Which will show the Farmer when the Potatoe is proper food for Man and Animals, and when dangerous.

ALSO,

MR. THOM'S INGENIOUS METHOD OF APPLYING SULPHUR VAPOUR.

Together with several extracts from scientific works, &c.

MANCHESTER:
JOSEPH GILLETT, PRINTER, 2, BROWN STREET.
1845.

AUTHOR'S PREFACE.

This Essay is produced at the request of several persons, who are aware that I have had opportunities for forming a proper opinion of the distressing malady now affecting the potatoe crop, which is deservedly attracting the attention of all classes of society. In early life I was nine years under the tuition of a gentleman who was devoted to the study of botany, and to the cultivation of vegetables. I have been a cultivator of potatoes for twenty years, and have paid *particular* attention to the culture of the plant. I have, in the course of the last month, visited hundreds of fields in different counties in England, making every necessary enquiry from practical men. Possessing a knowledge of chemistry, from being a practical chemist for thirty years, I feel confident that the following pages will be interesting to the public.

C. J. ABRAHAM.

Manchester, Nov. 8th, 1845.

100 parts of the Ashes of Wheat & Potatoes

Boussingault

	Wheat	Potatoes
Phosphoric acid	47	11.3
Sulphuric acid	1.0	7.1
Carbonic acid	—	13.4
Chlorine	traces	2.7
Lime	2.9	1.8
Magnesia	15.9	5.4
Pot ash	29.5	51.5
Soda	traces	traces
Silica	1.3	5.6
Alumina &c	—	0.5
moisture & loss	2.4	9.0

Potatoes	Water	Woody fibre or husk	Starch gum or Sugar	gluten & albumen & caseine	fatty matter	Saline matter
	75-0	5-0	12-0	2.25	0.3	0.8 to 1

Johnston

5 Cwt of guano mixed with fine sifted coal ashes a good manure for 1 acre of potatoes & laid on in wet weather or well watered

The Potato tuber is a perfect organised system in which the circulation regularly proceed, if suffered to ripen will then tend to decay; but if separated before ripe from the stem which furnishes it with blood or fruit sap, descending from the leaves, the circulation of the blood is suddenly arrested. The ripe Potatoe having performed all its operations, becomes more inert but the circulation of the sap in the unripe tuber having been stopped, it starts, with greater vegour when planted the one appears to die worn out with age — the other seems accidentally to have fallen asleep

Sulphate of magnesia as a top dressing to the growing Plants has produced a fine crop free from disease

AN ESSAY

ON

THE POTATOE,

&c., &c.

THE HISTORY OF THE POTATOE.

The Solanum Tuberosum, or Batatas, as called by the native Peruvians, was introduced into this country by that celebrated voyager, Sir Francis Drake, in the year 1486, he brought it from Peru, and I believe it was first planted in the vicinity of London. For several years it made but little progress in public estimation; in some soils the product was scarcely edible, in other soils the tubers were small, and subject to a variety of diseases. It was only by careful cultivation; by raising fresh varieties from seed; changing its position; friend sending the best kinds to friends in distant parts of the country; using a variety of manures and mixtures, that the potatoe became so esculent and valuable. It is stated that for

various reasons, considerable prejudice existed amongst farmers and others against their use and cultivation, for more than two hundred years, and even in our day the excessive cultivation of them is reprobated by individuals of high authority, as writers on horticulture and agriculture.

INDIGENOUS VEGETABLES.

I am not aware that this subject has claimed general attention, or the attention the matter deserves, but I have long maintained the opinion (and I am supported in this by several eminent agriculturists) that plants that are not indigenous to our soil and climate, require the marked attention of the cultivators of plants, vegetables, &c., far more so than those which are natives, or indigenous; see the difficulty in preserving the introduced red clover and other grasses; notice also the wheat plant, how subject to disease, what careful cultivation it requires; and several other plants which to enumerate would be foreign to the present subject, these require every effort of the most scientific cultivator to preserve their existence, while all our native weeds, grasses, and plants flourish luxuriantly in their peculiar positions, without our care. The prim-

rose peeps in the spring. The thistle, the yellow weed, and thousands of other weeds make their regular appearance in defiance of the efforts of man to destroy them.

It must be evident to every reflecting cultivator, that the potatoe, being a native of a warm and foreign clime, and not yet naturalized on the generality of soils, must be subject to disease, and be in some seasons a deficient crop.

THE PRESENT MURRAIN.

It is stated, that about one hundred years since a similar complaint to the present attacked the potatoe, and about forty years ago a disease, called the curl, appeared in several parts of the country, especially amongst the kidney variety; it produced considerable anxiety amongst both growers and consumers, but this affliction was removed in a few years, principally by procuring fresh seed *annually* from Scotland, and by a better system of cultivation; it generally appeared in July, the top was not larger than a curled parsley leaf, and something similar in appearance, the tubers were not larger than the hazel nut; and the crop was of course useless. In

stating my views on the present state of the potatoe, I shall, perhaps, differ in opinion from several who have communicated their ideas to the public.

It is stated by some, to be caused by insects or fungi, but by a careful reading of the opinion of Professor Liebig, on vegetable decomposition, (who also brings to his aid, the opinion of other eminent men,) we must be satisfied, that the insects when found, are attendants on decomposition, and not the cause of it.

DECOMPOSITION BY FERMENTATION AND PUTREFACTION.

"The microscopical examination of vegetable and animal matter, in the act of fermentation or putrefaction, has lately given rise to the opinion, that these actions themselves, and the changes suffered by the bodies subjected to them, are produced in consequence of the development of fungi, or of microscopical animals, the germs or eggs of which are supposed to be diffused everywhere, in a manner inappreciable to our senses; they are supposed to be developed when they meet with a medium fitted to afford them nourishment.

"In all chemical processes, and in all changes effected by chemical affinity, we observe that contact is essential for the exercise of the acting power. Hence, chemists describe affinity as a force distinct from other powers, because it acts only in immediate contact, or at inappreciable distances. Thus contact plays an important part in every case of combination or decomposition, for without contact these changes would not take place. In this sense, all substances effecting combination or decomposition, are bodies acting by contact.

"Gay-Lussac showed by experiments that the juice of grapes expressed apart from air, under a bell-jar full of mercury, did not enter into putrefaction, although it did so in the course of a few hours when air was admitted. The same chemist also showed, that fermentation immediately commences on the introduction of oxygen gas, of which a quantity is absorbed equal only to $\frac{1}{120}$th part of the volume of carbonic acid evolved during the fermentation. It can scarcely be supposed, that the germs of fungi exist in chlorate of potash or black oxide of manganese, out of which the oxygen was obtained: and hence, it is difficult to ascribe to a growing vegetation the causes of the decomposition.

"Gay-Lussac further showed, that the juice entered into fermentation on being connected with the wires of a galvanic battery, under circumstances, therefore, which quite excluded the introduction of every foreign body. Hence the view, that the fermentation of sugar is effected by contact with growing plants, must presuppose that living beings, plants for example, may be formed and developed without germs or seeds—a circumstance in direct contradiction to all observation regarding the growth of plants.

"It is certain that sponges and fungi, growing in places from which light is quite excluded, follow laws of nutrition different from those governing green plants; and it cannot be doubted that their nourishment is derived from putrefying bodies, or from the products of their putrefaction, which pass directly into this kind of plants, and obtain an organised form by the vital powers residing within them. During their growth they constantly emit carbonic acid, increasing in weight at the same time, while all other plants, under similar circumstances, would decrease in weight. Hence it is possible, and indeed probable, that fungi may have the power of growing in fermenting and putrefying substances, in as far as the products

arising from the putrefaction are adapted for their nourishment. When a quantity of fungi are exposed to the temperature of boiling water, their vitality and power of germinating become completely destroyed. If they be now kept at a proper temperature, an evolution of gas proceeds in the mass thus treated; they pass over into putrefaction, and, if air be admitted, into decay; and at last nothing remains except their inorganic elements. The putrefaction in this case cannot be viewed as the act of the formation of organic beings, but as the act of the passage of their elements into inorganic compounds.

"Observations of another kind,—for example, that flesh and other animal bodies may be kept for several weeks without putrefying, if placed in a vessel containing air previously heated to redness,—have gone far to support the opinion that the process of putrefaction is effected by the growth of organic beings: but all such experiments are of very subordinate value in support of these conclusions. In some experiments instituted by the author, for the purpose of detecting quinine in the urine of a patient in the habit of taking this medicine, he obtained the remarkable result, that this urine kept for several weeks

without passing into complete putrefaction, although the urea of urine, under ordinary circumstances, is often completely converted into carbonate of ammonia, in the space of six or eight hours. In the present case, the urine effervesced only slightly with acids after fourteen days. This seemed to give sufficient foundation for the opinion that the quinine must be the cause of this delay in the putrefaction. But further experiments proved that common urine introduced when freshly drawn into perfectly pure vessels behaved in an exactly similar manner. When a little putrefying urine was added to the fresh urine, the putrefaction of the latter was accelerated in a high degree. Wood, in which urine had been retained, exerted this action in a very decided manner, and the white, or yellowish-white deposite from putrefying urine (which does not possess an organised form) effects the conversion of urea into carbonate of ammonia in the course of a few hours.

"Fresh flesh remains for several weeks without experiencing appreciable change in the perfectly pure glass vessel, whether the latter contains common air, or air previously heated to redness; but, at the same time, it absorbs oxygen and emits carbonic acid, and passes into putrefaction,

if the necessary quantity of water be present, without being prevented or retarded by the air thus treated.

"It cannot be supposed, that dung-flies, living upon animal excrements, are the cause of this putrefaction; neither can a similar conclusion be drawn in the case of mites and maggots found so abundantly in old cheese.

"When we consider, that the intermediate products formed in the passage of animal and vegetable matters into inorganic compounds possess the power of supporting the life of certain animals and vegetables low in the scale of creation, then, the only mystery is, in what manner the germs of the fungi, or the eggs of the infusoria, reach the place fitted for their development; for this being known, there is no difficulty, since the discoveries of Ehrenberg, in conceiving this extraordinary increase. Now, as it is observed that the infusoria increase in size only to a certain point, it must hence be concluded that their nourishment, even if only from the point at which they are to grow, passes out of their bodies in the form of excrements, precisely as in the higher orders of animals. As is the case with all other excrements, these

must possess, in an eminent degree, the property of passing into decay or putrefaction; and this condition must at all events be induced by contact with the original putrefying body. Hence the increase in numbers of the infusoria must induce and accelerate the process of putrefaction in the putrefying body itself. The ultimate products of decay and putrefaction are carbonic acid, ammonia, and water. In order to comprehend the chemical process by which this conversion is effected, it is of much interest to become acquainted with the intermediate compounds formed by the elements. But in regard to the process itself, it is, chemically speaking, quite indifferent whether the first, second, or third product, before they assume the final state, be in the form of fungi, or of living animals (infusoria). These plants and animals are not the causes of the conversion, for they suffer after death the same changes which finally occasion their complete disappearance."

Some chemists suppose this disease is from an excess of ammonia in the tubers, but we find that vegetables under decomposition yield ammonia, then of course ammonia is only the production of the putrescence *and not the cause of this affection.*

The present disease is generally believed to have commenced in July, and to have increased with the growth of the potatoe; the early, and the second varieties, when early planted, and also, those that were deep in earth, have escaped pretty generally.

The farmers mostly believe that it commenced in July, after a chilling easterly wind for two or three days, accompained, and succeeded by heavy rain; a change was certainly perceptible on the leaf and stem, and this yellowness was succeeded by a black appearance of the leaf, and the stem being injured by the storm, allowing the freer admittance of the rain to the tubers.

My decided opinion is, that this is a cessation of growth from some cause, and the above is very likely to have been the cause; whether that storm was accompanied by any peculiar atmospheric influence, will, of course, be only a matter of conjecture. My idea is that it was so accompanied.

In the affected part there is evidently a deficiency of starch, and viewed under the microscope, it shows an imperfect moss, of a peculiar

species. It appears the same as that which attacks the wheat plant, in several parts of England, which passes under the name of "Deaf-Ear," or "Black Smut," &c., which is black to the naked eye, but brown when viewed under the microscope; also, the same disease affects the Rye and produces the "Ergot;" this disease is more prevalent on land which does not contain the elements necessary for the perfect formation of the seed, it will be seen by reference to the plate, that there is a remarkable similarity in the shooting of the diseased fibre; the drawing of the wheat was taken in the autumn of last year, from a coarse specimen growing to the height of seven feet, and is correctly drawn. I should here remark, that the potatoe, receives more nutriment from the top, than wheat, and the wheat receives its principal nourishment from the soil, yet in this instance it will appear, that the disease is not communicated to the wheat, until near the period of semination, and then it increases rapidly, until the whole ear is imperfect.

There is every reason to believe it is moss, for we find, where, from the nature of the soil, our native grasses fail, nature is capable of producing moss; moss is principally gluten and

fibre, such is its ready formation, that even the stone wall is sufficient for its growth, it wants but the aid of water, and what is floating in the atmosphere for its production; but with the potatoe it is different, it wants elementary matter to form the starch and other matters, to render it esculent and perfect, but this season it has not been able to attract the necessary provision, by the top being injured, consequently there is a malformation, and if in very wet ground and much affected, decomposition; and we are aware how rapidly putrescence communicates to the surrounding parts, when once it commences, in vegetable, as well as animal life.

The absence of starch in the affected parts is readily proved, a slice of the potatoe partially affected should be treated with iodine dissolved in spirit of wine; the presence of starch is indicated by the beautiful blue appearance of the perfect part, while the diseased will remain brown; when magnified, the different appearance of the parts is very plain.

It is a singular fact that the potatoe developes saccarine matter when grown in a warm climate, and frequently in England; on sandy soils and

hot summers this effect takes place, and when the potatoe is slightly affected with frost, saccarine matter is produced; from this we should learn, that the potatoe, to be perfect and agreeable, requires a favourable climate as well as a genial soil, and that if more attention is not paid to its habits, to its culture, and to its storing; it bids fair to become in a few years almost a useless plant as human food. Considerable damage has been done this season by putting them too early in heaps in the ground; it has very much increased the decay by what the growers call sweating; the progress to decay has been rapidly increased by the confined, heated, and moistened air. I have met with some people who believe, and try to prove, that early frosts were the cause of the malady, but it is well known to have commenced some time before the severe frosts; but I would remark that these frosty nights did considerable mischief and accelerated the decay, preventing all chance of the crop recovering.

In some situations the frosts were fatal to a part of the crop, but these may be detected from those before affected by their black appearance, and even when exposed to dry air, they decay entirely; these certainly are unfit for food for

human beings or cattle, not so with the diseased ones, but this will be treated upon in our future pages.

WILL THIS MALADY BE PROPAGATED.

I think a perfect potatoe will be the preferable for seed, and as we are now pretty certain of a considerable quantity being saved in their usual perfection, it will be advisable to use none but sound ones: there are in several districts some valuable kinds not at all affected. The ashleaved kidneys, the everlasting kidneys, are free from the disease generally. The Wadkins, the Radicals, and various others, solid in texture, and possessing the good quality of progressing more rapidly into tubers, than most other varieties; these are only partially affected, and for a general crop, should be next season extensively used for seed. The bread fruit and others, late in this formation have suffered most severely, especially when set late in the season.

For the last four or five years, a great complaint has been made by the consumers against the growers, for supplying the markets with half grown potatoes, and from this may have arisen

the prejudice, that the plant was rapidly detereorating in quality,—in this period it has been to the benefit of the grower to hasten off the crop, to make room for turnips. The increase of turnip crops in Cheshire, Derbyshire, Staffordshire, and Lancashire, has been very great in the last four years. To gain the most profit, the grower plants the large winter varieties, these are taken to market only half grown, yet producing a larger quantity than if he had planted the early and second kinds, with a considerable saving in the price of his seed, but this convenience to the farmer is very injurious to the consumer, being unfit for human food, and gives rise to the opinion, that the time is coming when the potatoe will be useless.

To propagate it and improve the quality, more attention is necessary than they have had heretofore; new kinds should be raised from the apples, more frequent exchange should be made with the seed; fresh manure and mixtures of soils should be sought after; every grower should make experiments with these mixtures and manures, on different parts of his land, and carefully taking an account of the results; and then I hope, in a few years, that this disease, although

so direful in its effects for the present, will eventually be of benefit, by attracting more attention to the culture of the plant.

ARE THE POTATOES FIT FOR FOOD.

I should say in their present state if well dried, and boiled in two waters, if freed from the decomposed parts, that they are not pernicious.

I find that they are given freely to pigs, cows, and horses with impunity, and are frequently taken as human food. I have not seen, neither have I heard of bad effects from their use; they have been tried for more than two months, and a general opinion prevails that they are not pernicious; with respect to their use, as the season advances, and when the decay has advanced, the result may be different.

It is a fact, that no vegetable, even in the simple stage of fermentation, can, by the generality of human beings, be taken with impunity, when the digestive organs are in a state of debility, even green peas and all the vegetables of the Bracci tribe produce mischief; several people feel the bad effects of these in warm

weather, when they have only been gathered a few hours before, but heated in their transit to the market; then what must be the effects on the stomach and system generally, when in a putrid state? I should say decidedly, that potatoes in this stage are dangerous to use, and should not be given to animals, and are capable of producing spasms, fevers and a variety of diseases, usually produced by damaged and unwholesome grain.

TO DETECT THE PRESENCE OF PUTRESCENT MATTER.

This requires but little skill or trouble. Take the diseased or suspected parts, mash them or pound them well, pour on to them boiling water, say double their quantity—a tea-cupful will be sufficient for a testing—keep this covered for half an hour, strain, add a few grains of carbonate of soda, hold over this cup a stopper fresh from a bottle containing the spirits of salts (hydrochloric acid), if ammonia is present dense white fumes will surround the stopper; to make the experiment familiar, try the stopper over a bottle of smelling salts, and with a little practice the peculiar fume cannot be mistaken.

THE BEST METHOD TO PRESERVE THEM.

I would remark, that the able report of the commissioners appointed by her Majesty's Government, which has been forwarded to his Excellency the Governor, and printed, will be found excellent, and should be carefully attended to. *(See appendix.)*

I have found that dried saw-dust was the most effectual in preserving the Dahlias; I have tried it for years; and the Dahlia being of the same tribe of plants, I feel satisfied that partially charred saw-dust will be found the most useful and cheap article that can be used. Wet saw-dust should be avoided, it possessing the property of evolving carbonic acid, &c., and hastening the decay.

APPENDIX.

No. 1.

THE BEST METHOD OF CULTIVATION.

The deficiency of the crops should call the attention of all persons acquainted with good methods of raising early crops. I would say, leave no reasonable method untried which is recommended by respectable and well-informed parties. The saving of seed is an important matter. It is recommended for our early and second crops, that sound potatoes of different sizes should be selected and exposed to the air for a few weeks, covering them slightly to prevent injury from excessive sun ray; and also, in very wet weather they should be covered completely; a few of these should be planted in November, on a warm border, and covered with litter, to save them from severe frosts,—they should be planted deep, and the earth partially removed in the spring. For a general crop, if they are wanted early, it is a good plan (and now very much adopted in some districts) to place the tubers in a spare room, where the temperature will be near forty of Fahrenheit; and this season every potatoe should be

slightly covered with dry saw-dust, sand, or burned soil, to prevent any communication with each other; these may be carefully removed early in the season, but on no account breaking the germs; if the soil is not of the best quality, make up a mixture of old turf, decayed leaves, river sand, or sand washed and free from mineral oxides; mix these with some decaying manure, such as from an old cucumber bed. This should be prepared immediately, and give the land a good covering, laying carefully on this the tubers with the sprits on; cover these with sandy soil or good sand alone; by this plan, at a cheap rate, the markets may be supplied the first week in June, in this neighbourhood.

For the next crop the early radical and the everlasting kidney, and, afterwards, the late radical should be planted from carefully selected seed early in April; if the land is rich and has been frequently manured, the kidneys should, under each potatoe, have a grass clod or turf about the size of the hand, instead of manure; the radicals are best with carbonized substances,—wood ashes, with a little manure, are excellent. These ashes prevent the attack of grubs, and, of course, the potatoes are clear skinned. It is a good plan to dig in the ashes at the latter end of the year, and frequently disturb the soil, exposing it to the frost; burned clay, with the addition of some alkaline salt, would be a good substitute. Our second potatoes should on no account be set too near each other; the crop will be also increased

about one-fifth by removing the flowers as they form; high ridges to plant them on is advised by many, but this must depend on the nature of the soil; these escape the excessive wet, and get more benefit from the atmosphere,—it is a mistaken notion to suppose they would be more exposed to the frost by being on ridges. It is well known that the crop suffers most in low and damp situations; frost injures the top simply from expanding the circulating fluid and crystallizing the salts and water which they contain, and when the sun rises they wither. I would observe here, that a crop of potatoes frost-bitten at the tops may frequently be saved by drenching them with water, just as the sun is rising, but not before, as this would increase the mischief; it is done on the same principle as putting frozen vegetables into cold water, which renders them wholesome, while the warm water seriously injures them.

The cultivation of the late potatoes must vary in different districts and soils; but to write much on this subject would be useless, for it is a notorious fact that the farmer plants them to suit his own convenience. With respect to rotation of crops and to the obtaining a LARGE crop, the quality is out of the question; we certainly want some fresh breeds,—all classes acknowledge this, lament it,—but know not the remedy.

I leave this matter to the consideration of the agricultural societies, who must acknowledge that it has heretofore been neglected.

No. 2.

MANURES.

The best manure for the winter crops is said to be the pig dung; the next, that picked from the roads; and I think this opinion correct; but good stable dung may be used if it contains not much straw. Littery manure should be avoided, having a tendency to mouldiness and the production of fungi, especially on land which has been repeatedly manured and abounding in phosphates.

Guano and the artificial manures may be used with advantage. I have inquired particularly respecting the effect of guano on the disease; I have not yet found any one to trace the disease to it; but, on the contrary, it is said the disease has not caused so much mischief where it was used. I am a strong advocate for the use of burned vegetable matter, in preference to the decayed; the bane of the generality of our soils is the grub, and the varied tribes lower in the scale of creation.

It is a fact that charcoal is the only remedy for the Bracci tribe of plants when infested with insects at the roots, which is called clubbing. The Lincolnshire Wold produced turnips only the size of the finger (the old farmers used to say they went to fingers and toes)

before the surface was covered with carbonate of lime and bones, and now they are equal to any land. Our poor and sandy soils require enriching, and only very poor crops will be obtained without; good stable manures answer well on these lands, being less subject to the developement of fungi than the rich land.

I would further remark, that land in a state of nature requires not the aid of burned substances,—such was the state of the Wolds in Lincolnshire seventy years ago,—but carbonates in the state of marl; such was the state of Delamere Forest, which was much improved and rendered fit for the cultivation of potatoes, turnips, &c., by the application of a mouldering slate; but it is the part abounding in phosphates that requires the aid of charcoal.

No. 3.

COMMISSIONERS' REPORT.

"Board Room, Royal Dublin Society,
October 24th.

"My Lord,—We, the undersigned commissioners appointed by Her Majesty's Government to report to your Excellency on the state of disease in the potatoe crop, and on the means of its prevention, have the

honour to inform your Excellency that we are pursuing our enquiries with unremitting attention.

"We are fully sensible of the important and difficult nature of the inquiry, and therefore are unwilling to offer, at the present moment, any final recommendations, as we are still receiving evidence, and awaiting the results of various experiments now in progress. But at the same time we ought to state to your Excellency that we have reason to hope the progress of the disease may be retarded by the application of simple means, which we trust may appear worthy of adoption, until we are enabled to offer further recommendations.

"In the present communication we avoid entering into any account of the origin or nature of the disease; but we would particularly direct attention to the ascertained fact, that moisture hastens its progress, and that it is capable of being communicated to healthy potatoes when they are in contact with such as are already tainted. A knowledge of these facts, determined as they have been by experiment, and agreeing with the scientific information obtained as to the causes and nature of the disease, lead us to propose the adoption of the following plan for diminishing the evils arising from this destructive malady:—

"In the event of a continuance of dry weather, and in soils tolerably dry, we recommend that the potatoes should be allowed for the present to remain in the land;

but if wet weather intervene, or if the soil be naturally wet, we consider that they should be removed from the ground without delay.

"When the potatoes are dug out of the ground, we are decidedly of opinion that they should not be pitted in the usual way, as the circumstances under which potatoes are placed in ordinary pits are precisely those which tend to hasten their decay.

"We recommend that potatoes when dug should be spread over the field, and not collected into heaps, and if the weather continue dry and free from frost, that they should be allowed to lie upon the field for a period of time not exceeding three days.

"The potatoes, after being thus dried and improved in their power of resisting disease by the means proposed, should then be sorted, by carefully separating those which show any tendency to decay. Those potatoes which appear to be sound should then be placed about two inches apart in a layer, and over each layer of potatoes should be placed a layer of turf ashes, or dry turf mould, or dry sand, or burnt clay, to the depth of a few inches. Thus will be formed a bed of potatoes, each potatoe being completely separated from the other by a dry absorbent material; upon this bed another layer of potatoes should be spread in like manner, and be also covered with the dry materials employed; as many as four layers may thus be placed one above the

other, and when the heap is completed it should be covered with dry clay, straw, heath, or any other material adapted to protect it from rain.

"In the event of the weather becoming wet, these recommendations are not applicable. In that case we would advise the potatoes to be packed in small heaps, with either straw or heath interposed, and well covered; in such a situation they should become as well dried as seems practicable under the circumstances. Where out-buildings exist, it would be advisable that this mode of temporary packing should be carried on in those places. If there be no out-houses, the heaps may be left in the open field. We, however, particularly recommend that potatoes should not be removed into inhabited rooms.

"With regard to the treatment of potatoes already attacked with the disease, we have to state that in this early stage of our investigation, we do not feel justified in proposing to your Excellency any more positive treatment—this subject we reserve for a future report; but we may remark that exposure to light and dryness in all cases retards the progress of alterations, such as the disease in question, and we therefore suggest that all such potatoes should, as far as possible, be so treated.

"We do not mean to represent that these recommendations, if carried into effect, will prevent the occurrence of disease in potatoes, but we feel assured that the decay will extend less rapidly, and less extensively under

these circumstances, than if the potatoes, when taken from the ground, be at once pitted in the usual manner. Neither do we offer these suggestions to your Excellency as a final means of securing the crop, but merely as a method of retarding the progress of an enemy whose history and habits are as yet but imperfectly known, whilst we endeavour to ascertain the means of more completely counteracting its injurious effects, if any such can be discovered."

"All which we submit to your Excellency's consideration, and remain,

Your Excellency's obedient and faithful servants,

"Robert Kane.
"John Lindley.
"Lyon Playfair.

"To his Excellency Baron Heytesbury, &c."

No. 4.

MR. THOM'S EXPERIMENTS.

"At the meeting of the Literary and Philosophical Society on Friday, at which a number of medical and scientific gentlemen attended, for the purpose of considering the best means of arresting the progress of the

present disease in the potatoe crop, Mr. John Thom, chemist, communicated the result of some interesting experiments he had made with diseased tubers. Dr. Black had previously suggested salt as a means of destroying the disease, but Mr. Thom said, it had a remarkable effect in hurrying the destruction of the potatoe, rendering it a black, pulpy mass. Chlorine, in the state of chloride of lime, he said, checked the disease the first day, but afterwards it was subject to the same objection as salt, the muriate of lime producing a similar action. A mixture of nitric and muriatic acid, in the proportion of half an ounce of the former and one ounce of the latter to the gallon of water, seemed to destroy it at first; when first applied it gave a bad colour to the potatoe, but that speedily disappeared. Drying them was certainly the most efficacious plan; but in doing so two things should be attended to:—First, that a free circulation of air should be provided for, wherever there was heat admitted; secondly, that the heat be not too strong, for then the water does not go gradually off the potatoe, but a crust is formed round it, thus preventing the water from coming out, and hastening the decay of the potatoe. Sulphurous acid has a most remarkable effect in checking the disease, and Mr. Thom stated, that about an hour before the meeting, some diseased potatoes subjected to that treatment were boiled, and tasted perfectly sweet. In boiling, they gave out a most offensive odour, and the water which came from them was acid. Potatoes, also diseased, and which had not been subjected to the sulphurous process, gave out,

when boiled, an exhalation more peculiar to the disease, and were quite uneatable. One pound of potatoes which had been exposed to the fumes of sulphur, were rasped, in order to estimate the quantity of starch which it contained, and that pound yielded two ounces and about a quarter, or 12 per cent. A pound of kiln-dried potatoes, equivalent to one pound and a half of undried potatoes, gave only two ounces and a half; showing that the potatoes submitted to the sulphurous process had actually a great deal more starch than those which were kiln-dried. The loss of starch in the kiln-dried potatoes was not caused by the mere drying, but when undergoing that process, a portion of the starch had been destroyed; the potatoe became quite flexible, and the starch seemed to be completely out of it. In the first stage of the disease, the potatoe was distinctly acid to test paper; when the disease advanced, and the potatoe assumed that peculiar brownish black appearance, it was alkaline. The sulphur, unlike most chemical solutions, had a remarkable effect in penetrating the whole mass; and after coming out of the sulphur chamber, the potatoe was apparently destroyed; it was quite soft and flexible, but that went away in a few hours, and they became as hard as any others. Mr. Thom also stated that he had kept a number of the potatoes in a damp situation, to see if the disease would again appear, but it had not done so yet; so that there is no doubt but the process will so far check the disease as to enable the potatoes to be thoroughly dried.

"The following is the mode of sulphuring which he proposes:—Take an outbuilding, which can be well closed, or a room in the dwelling house, and put up temporary shelves, by placing planks on bricks; or any other plan may be adopted by which the potatoes may be exposed in layers of two or three deep. Then, for every ton of potatoes put into an iron pot or tray from 12lbs. to 20lbs, of sulphur, according to the extent of the disease; drop on different parts of the sulphur a few pieces of iron or stone, made red hot, so as to kindle it. When all the air is out of the room, which will be in a few minutes after the sulphur is kindled, shut the door and confine all the openings to the room. Allow the potatoes to stand so for a few hours, or a whole night will do no injury. After opening the door and the fumes of sulphur are expelled, the potatoes may be removed to make room for more. The potatoes thus treated, to be dried as soon as convenient. The sulphur, it was stated, would not cost more than 2s. or 3s. for the quantity necessary to affect a ton of potatoes.—Mr. Thom laid on the table specimens of potatoes subjected to this treatment, and also some which had been tried with hot air; but the latter were completely destroyed, having a crust formed round them, while the inside remained in a state of disease."

Manchester Guardian.

J. GILLETT, PRINTER, 2, BROWN STREET, MANCHESTER.